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ABSTRACT

An Arkansas project developed a model practical nurse program that offers a nontraditional approach to instruction. Computer-assisted and computer-managed instruction was integrated into the competency-based curriculum, and the model was to be replicated in other licensed practical nurse (LPN) programs. The project was divided into six phases: ordering equipment; setting up a computer laboratory; designing a competency framework; designing and developing competencies for each content area; implementing the model; and evaluating the project. Students used the software program "ChartSmart" to learn charting; it was rated as an excellent tool. The project showed that computer testing saved the instructor's grading time. The effectiveness of the competency-based approach was demonstrated by the 98 percent passage rate on the National Council Licensure Examination (NCLEX) achieved by program graduates in 1988-89 and 1989-90 compared with the statewide average passage rate of 85-87 percent. One-hundred percent of the program graduates were placed. Evaluation of the project showed that using competency-based, computer-assisted, and computer-managed instruction is a very effective means of providing high quality education. However, using this means of instruction is more expensive and does require the instructor to be more organized. Continued development was recommended. (KC)

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FINAL REPORT

A PROJECT TO DESIGN AND IMPLEMENT A COMPETENCY-BASED, COMPUTER-ASSISTED AND COMPUTER-MANAGED PRACTICAL NURSE PROGRAM

Conducted by

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Melbourne, Arkansas
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In cooperation with
Vocational and Technical Education Division
Arkansas Department of Education
Little Rock, Arkansas 72201

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INTRODUCTION

At the time of this study there were no practical nursing programs in Arkansas that offered a competency-based, computer-assisted, and computer-managed approach to individualized instruction. Yet, it was quite evident that health care facilities were becoming increasingly sophisticated and regionalized requiring highly skilled competent practitioners. Many small hospitals in rural areas of Arkansas were in the process of closing. Thus, rural nursing schools in particular were facing declining clinical training sites.

OBJECTIVES

The purpose of this study was to develop, implement, and evaluate a model practical nurse program that offered a modernized approach to individualized instruction.

The overall goal of this study was to design a model LPN Program utilizing a nontraditional approach of instruction. Computer-assisted and computer-managed instruction were to be integrated into the competency-

based curriculum. The model was designed so as to be replicated in other LPN programs.

The specific objectives were as follows:

1) To demonstrate the effectiveness of competency-based education in practical nursing.
2) To establish computer-assisted instruction as a viable teaching method in practical nursing.
3) To incorporate computer-managed instruction as an integral classroom management method in practical nursing.

PROCEDURES

The procedural approach was to divide the project into six phases. Phase I included ordering equipment, setting up a computer lab, and designing a competency framework. Phases II through IV involved actual competency design and development for each content area. Phase V was to involve the implementation of the model. Phase VI was to involve the evaluation of the project. The methods and

procedures used during the study will be discussed for each objective respectively.

The first objective, to demonstrate the effectiveness of competency based education in practical nursing, is ultimately determined by the passage rates of the graduates. The 1988-89 and 89-90 LPN graduates from this project have a 98% passage rate on the NCLEX exam. The Arkansas state passage rate normally averages between 85 and 87%. The placement rate for these graduates is 100%.

Throughout this project, class averages per content area have been monitored and compared with previous years' class averages. Table 1 depicts the class averages for five subject areas.

Table 1

Class Averages in Five Subject Areas

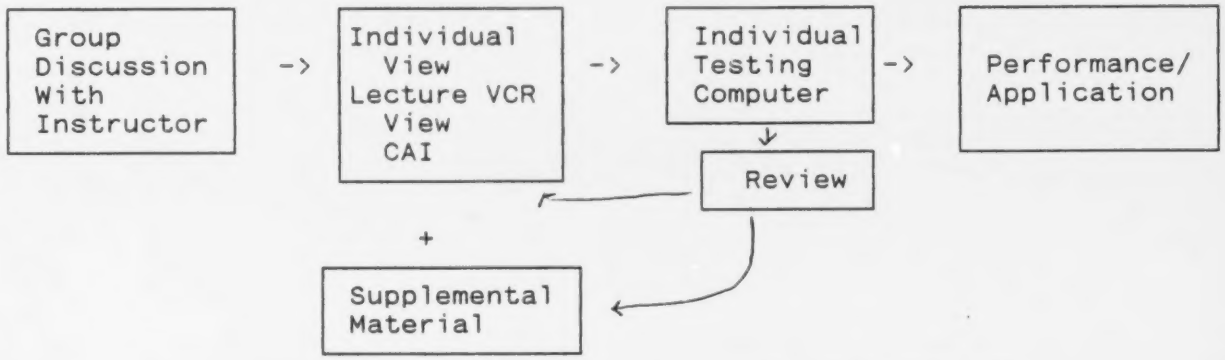
Year	Mental Health	Anatomy & Physiology	Nurs I	Pharmacology	OB
85-86	87.9	84.4	86.7	87.5	91.1
86-87	88.4	90	88.5	91.3	91.8
87-88	90	89	90.4	94.3	92.2
88-89	91.6	92.2	92.7	94.5	91.9
89-90	82.5	86.5	89.8	87.5	86.5
90-91*	92.8	90.9	90.3	94.9	89.4

*Competency-based curriculum

Table 1 shows that the class of 90-91 grade averages stayed well within the norms and in two subject areas exceeded the highest class average.

During the study, several different competency models of instruction were identified and practiced. The model for the practical nurse that was most successful is illustrated in Figure 1.

Figure 1 COMPETENCY-BASED PRACTICAL NURSE MODEL



This model allows for individualized instruction and is performance based.

The second objective, establishing computer-assisted instruction as a viable teaching method was determined by conducting a study on computer testing and computer-assisted instruction (CAI).

A study was conducted from January through April 1991 to compare traditional testing (paper & pencil) with computer testing. Test scores, student evaluation, and amount of time involved were the variables evaluated. A group of 11 LPN students were randomly divided into two groups. While one group was taking a unit test on the computer, the second group was taking the same test using paper and pencil. Students were asked to note the amount of time taken for each test and also evaluate the testing method on a scale of 1 to 5. Both groups alternated taking paper & pencil with computer tests. A total of 14 unit tests and one midterm was taken using these methods. The content area tested was Nursing of the Adult Client. Table 2 depicts the mean, median, mode, and standard deviation for each test score by group.

Table 2
Mean, Median, Mode, and Standard Deviation of Test Scores

	Paper Group	Computer Group		Paper Group	Computer Group
Unit 3	(n=6)	(n=5)	Unit 19	(n=4)	(n=5
Mean	81.8	80.0		84.250	87.2
Median	83	83		86	88
Mode	83	83		88	multi
S. D.	11.393	8.438		4.493	6.58
Unit 4	(n=6)	(n=5)	Unit 20	(n=4)	(n=6)
Mean	84.16	89		91	91.33
Median	85	90		90	92
Mode	80 & 95	90		90	92
S. D.	10.574	8.000		4.359	3.39
Unit 5	(n=6)	(n=5)	Unit 21	(n=5)	(n=6)
Mean	87.5	91.6		85.4	83.83
Median	91	91		83	82
Mode	91	86		83 & 90	74 & 98
S. D.	11.147	5.389		3.826	11.92
Unit 13	(n=5)	(n=6)	Unit 23	(n=6)	(n=5)
Mean	90.4	84.833		86.3	88.8
Median	90	85.5		87	94
Mode	87 & 94	90		87	98
S. D.	3.137	9.740		5.088	10.7
Unit 15	(n=5)	(n=6)	Unit 24	(n=6)	(n=5)
Mean	88	82.167		74.833	65.6
Median	88	82.5		73	77
Mode	88	84		73	multi
S. D.	3.347	6.694		8.009	32.50
Unit 17	(n=6)	(n=4)	Unit 26	(n=8)	(n=3)
Mean	70.3	82		87.750	89
Median	70	82		88	87
Mode	60 & 80	74 & 90		91	multi
S. D.	13.683	8.0		5.629	8.28

Table 2 (Con't)

Mean, Median, Mode and Standard Deviation of Test Scores

	Paper Group	Computer Group
Unit 30	(n=6)	(n=5)
Mean	79.16	83.6
Median	85	81
Mode	85	81
S.D.	10.23	10.3
Unit 31	(n=6)	(n=5)
Mean	77	84.6
Median	76	89
Mode	76	multi
S.D.	9.71	11.48
Midterm	(n=3)	(n=8)
Mean	80	86.25
Median	78	86
Mode	multi	multi
S.D.	3.55	4.89
Midterm1	(n=3)	(n=8)
Mean	80.67	87
Median	82	89
Mode	multi	80 & 93
S.D.	2.625	7.451

The overall mean for the 14 unit tests (paper group) was 83.42 compared to the overall mean of 84.54 in the (computer group). Those students taking the computer test scored slightly higher overall. When the midterm results are included in the overall mean, the

(paper group) had a mean of 83.03 and the (computer group) had a mean of 84.8. Based on the above data this investigator feels that computer testing is an equivalent method of testing.

Table 3 depicts the mean and standard deviation of the student evaluation of the testing method.

Table 3
Mean and Standard Deviation of Student Evaluation of Testing

	Paper Group	Computer Group		Paper Group	Computer Group
Unit 3	(n=6)	(n=5)	Unit 20	(n=3)	(n=6)
Mean	3.5	3.0		3.333	3.667
S.D.	0.5	0.632		0.471	0.943
Unit 4	(n=6)	(n=5)	Unit 21	(n=3)	(n=6)
Mean	4.0	4.2		3.333	3.167
S.D.	0.0	0.748		0.943	1.344
Unit 5	(n=5)	(n=5)	Unit 22	(n=3)	(n=5)
Mean	3.4	4.0		4	4
S.D.	0.8	0.632		0.0	0.632
Unit 13	(n=2)	(n=6)	Unit 24	(n=4)	(n=5)
Mean	3.5	3.5		3.750	3.4
S.D.	0.5	0.957		0.433	1.744
Unit 15	(n=4)	(n=6)	Unit 26	(n=7)	(n=3)
Mean	3.75	3.5		3.714	3
S.D.	0.433	0.957		0.452	0.816
Unit 17	(n=3)	(n=4)	Unit 30	(n=6)	(n=3)
Mean	3.667	3.5		3.5	4.33
S.D.	0.471	0.5		0.5	0.471
Unit 19	(n=3)	(n=5)	Unit 31	(n=4)	(n=2)
Mean	3.667	3.6		3.250	4.5
S.D.	0.471	1.020		0.433	0.5

Table 3 (con't)

Mean and Standard Deviation of Student Evaluation of Testing

	Paper Group	Computer Group
Midterm	(n=3)	(n=8)
Mean	3.667	3.875
S.D.	0.471	0.781
Midterm1	(n=3)	(n=8)
Mean	3.667	3.875
S.D.	0.471	0.781

Student's were asked to evaluate the testing method using a rating scale of:

1=poor
2=fair
3=average
4=good
5=excellent.

The overall mean for the 14 units of student evaluation of testing method was 3.6 for the paper group and 3.67 for the computer group. When the midterm is included the mean for the paper group is 3.61 and 3.69 for the computer group. The students rated the computer method of testing slightly better than the traditional paper test.

Table 4 displays the correlation between student evaluation of unit tests and test scores.

Table 4
Pearson-Product Moment Correlation between Student Evaluation of Unit Test and Test Score

	r	p
Unit 3	-0.145	0.674
4	0.517	0.101
5	-0.005	0.986
13	0.538	0.167
15	0.302	0.600
17	0.064	0.887
19	-0.504	0.201
20	0.265	0.504
21	-0.052	0.888
23	0.365	0.623
24	0.868	0.003*
26	0.611	0.059
30	0.023	0.952
31	0.173	0.739
Midterm	-0.306	0.630
Midterm1	-0.219	0.523

*p< .05.

Only one unit test in 14 showed any correlation (0.868) between how the student scored on a test and how they evaluated the test. There was no correlation between the student evaluation and midterm score. It is this investigator's opinion that students were not motivated to evaluate the testing method according to how they scored on the test.

Table 5 depicts the mean and standard deviation of the number of minutes per unit test.

Table 5

Mean and Standard Deviation of Number of Minutes per Unit Test

	Paper Group	Computer Group		Paper Group	Computer Group
Unit 3	(n=6)	(n=5)	Unit 23	(n=6)	(n=5)
Mean	8.333	12		30.333	28.4
S.D.	1.374	2.898		4.643	6.02
Unit 4	(n=6)	(n=4)	Unit 24	(n=5)	(n=5)
Mean	11.833	10.750		18	13.6
S.D.	3.436	0.433		4.858	8.59
Unit 5	(n=5)	(n=5)	Unit 26	(n=6)	(n=3)
Mean	20.2	22.0		25	18
S.D.	5.154	1.897		9.129	4.96
Unit 13	(n=5)	(n=6)	Unit 30	(n=5)	(n=3)
Mean	10.2	22.667		16.8	18
S.D.	2.926	5.121		3.655	4.96
Unit 15	(n=5)	(n=6)	Unit 31	(n=4)	(n=2)
Mean	17.6	24.833		33.5	32.5
S.D.	4.363	5.490		9.447	12.5
Unit 17	(n=5)	(n=4)	Midterm	(n=3)	(n=8)
Mean	11.6	12.250		42	32.5
S.D.	2.059	1.785		13.363	9.68
Unit 19	(n=3)	(n=5)	Midterm1	(n=3)	(n=8)
Mean	16.667	20.		35	33.37
S.D.	2.357	8.367		12.754	10.33
Unit 21	(n=5)	(n=6)			
Mean	30.8	22.667			
S.D.	15.574	4.497			

The overall mean for number of minutes in the paper group for the 14 tests was 17.92 and 18.42 for the computer group. When the midterm is included the mean for the paper group is 20.49 and 20.22 in the computer test. It took slightly less time to take the paper units than the computer tests. However, not included in these descriptive statistics is the fact that the computer testing included automatic grading of the test by the computer; the paper tests had to be later graded by the instructor. It is the feeling of this investigator that a significant amount of time is saved utilizing computer testing.

Table 6 depicts the correlation between the student's Nursing of the Adult Client grade and their overall GPA.

Table 6 Pearson-Product Moment Correlation between Nursing of the Adult Client Grade and Overall GPA

r	p
0.922	0.000*

*p< .05)

Table 6 shows a very strong correlation (0.922) at the (0.000) probability that student's scores in

Nursing of the Adult Client (14 unit tests and midterm) reflect similar scoring in other content areas. Student scores were not affected by the testing method.

Another study was conducted to determine the effectiveness of computer-assisted instruction. The software program ChartSmart was purchased and utilized to instruct each student on charting. The program consists of ten modules that can be done independently. Lesson plans were developed for each module. Instructions were given to each student and they then proceeded through all ten modules on an individual basis. The software modules were in a format that consisted of a unit of instruction followed by a game for positive reinforcement. This type of instruction is particularly well suited for the computer. The three variables examined during the study were charting content, time involved, and student evaluation of instruction method. Table 7 illustrates the results of the CAI on charting.

Table 7
Computer-Assisted Charting Results

MODULE	AMOUNT OF TIME (MINUTES)	COMMENTS
One	12.69	Clear Instructions, short easy to understand, informative, interesting, fun, good detail
Two	36.38	Learned a lot, clear instructions, helped to understand, made me think, fun.
Three	21.39	Fun, helped with spelling, made me use my head. I learned a lot by doing this type of practice work. Helps me remember better, love crossword puzzles. Good change of pace.
Four	40.61	Helpful, contains important information. Enjoyed, very good, productive information. Too long.
Five	17.28	Most helpful module so far. Games decrease stress. Lots of fun. Entertaining and educational. Mixes fun with learning.
Six	24.66	Made differences in methods of charting more clear. Very helpful. Good review, too long, too much information.
Seven	14.21	Didn't like, but helpful. Fun sticks with you better. Computer cheats.

Table 7 (Con't)
Computer-Assisted Charting Results

MODULE	AMOUNT OF TIME (MINUTES)	COMMENTS
Eight	64.89	I would like to do all the charting on this module. Had a hard time trying to figure what it wanted me to do. References great. Informative.
Nine	53.50	This was good practice. But it's a pain if you have to quit in the middle - you have to start over. One of the best modules so far.
Ten	75.64	Too long, interesting, a little hard to follow. Very good test. Helpful.

The results of the computer-assisted charting demonstrated that CAI can be a very productive in terms of content learned, amount of time spent, and satisfaction of the learner. The Instructor's rated the ChartSmart program "excellent."

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The third objective, incorporating computer-managed instruction as a classroom management method, was successfully completed during the early phases of study. Computer-managed instruction was divided into two categories: 1) management of student grades and computer activities per content area; 2) management of nursing department records. In the area of student grades, the software program, CLassroom Manager, was purchased and utilized to maintain all student grades. Each grading period a computer generated report is given to each student. Class grades are kept per student year on separate disks for permanent storage. The Instructor gradebook is kept as a secondary source. The software program calculates each student's score according to a weighted formula. This saves enormous amounts of instructor time. Previously, the instructor had to calculate with an adding machine each student's score and ranking. In the content areas of Anatomy & Physiology, Pharmacology, Learnership, and Nursing II, computerized tests were given which printed out each student's score. This saved instructor grading time. It also provided immediate feedback to the student, along with confidentiality concerning their individual

score. To determine the amount of computer usage a Computer Lab Log was kept. In the 1989 year from September through December, 186.85 hours of student computer time was logged. In the 1990 year from September through December, 228.40 hours were logged. Computer usage increased approximately 20 percent. There was no appreciable computer usage from January 89 through April 89. In January 90 through April 90, 144.4 hours were logged. The primary computer activity was computer testing. Other activities included word processing, drill and practice, and refresher work.

In the area of nursing records management, approximately 95 percent of all nursing records are now on computer disk. This was accomplished by simply processing into the computer the various records in the nursing department. It was decided to store all data on floppy disks according to the following categories:

General:

Correspondence
LPN Application and Information
Course Material
Clinical Rotation Papers
HOSA
Faculty
Clinical Check List
Mailing List
Contracts
Inventory

Advisory Committee
Snow Contracts
New Student Information

Transcripts Exit Information:

LPN Exit Information
LPN Transcripts 90-91 Class
LPN Transcripts 89-90 Class
LPN Transcripts 88-89 Class

Curriculum Files:

Basic Nursing T01
Nursing of Mothers and Infants T02
Nursing of Children T03
Nursing of Adult Clients T04
Mental Health Nursing T05
Body Structure and Function T06
Pharmacology T07
Nutrition T08
Learnership T09

Copies of each disk are made for backup purposes. Copy protection tabs are placed on all disks. The disks are stored in dustproof container's in the instructor's office. This method of data storage has proven very successful and helpful in reducing time spent in editing and revising materials throughout the school year.

Computer tests and quizzes for the various content areas have also been stored on floppy disks and placed in a secure area. For further information on computerizing a nursing office refer to Zimmer, E.

(1991) Computerizing Your Nursing Office, Journal of Practical Nursing, 3, 62-63.

EVALUATION

The three specific objectives of this project were all addressed and successfully achieved. Each objective will be discussed individually.

Objective 1: To demonstrate the effectiveness of competency-based education in practical nursing.

Graduates of the competency-based program have a 98% passage rate on the NCLEX. Placement is at 100 percent.

Objective 2: To establish computer-assisted instruction as a viable teaching method in practical nursing.

Computer testing was found to be equivalent to traditional testing. Students prefer this method by a slight margin. Computer testing saves instructor time.

Computer-assisted instruction is practical, efficient, and well liked by students.

Objective 3: To incorporate computer-managed instruction as an integral classroom management method in practical nursing.

Computer-managed instruction in the management of student grades is very productive in time savings and accuracy of records. It is an ideal way to manage a nursing office.

OTHER ACTIVITIES

Other significant activities that occurred during this study include:

1. Newsletter - A bimonthly newsletter was published and sent to all PN programs in state. Helped to network schools and students. Provided computer literacy.
2. Curriculum Editing - The project director worked with the state LPN Curriculum Project to revise and edit the LPN Curriculum Guide.
3. Computer and Project Presentations - Numerous presentations were given by project director at state and district meetings.
4. Workshops - Several workshops were given to other PN educators, RN's, and LPN's around the state on computer literacy, test banks, word processing, etc.

5. Software Production - Several generic vocabulary disks were completed. Copies of disks, word processing data, test banks, and vocabulary term quizzes, have been supplied to other PN schools upon request.
6. Video Production - Several pharmacology and computer related videos were made and have been supplied to other PN schools upon request.
7. Publication - Two articles on the project have appeared in professional journals.

CONCLUSIONS

It is the opinion of this investigator that competency-based, computer-assisted, and computer-managed instruction is a very effective and viable means of providing a quality education. The advantages of this method include: 1) individualization 2) more flexibility 3) less stress 4) significant instructor time savings. The disadvantages are: 1) more expensive (requires more equipment & computers) 2) requires instructor to be more organized.

RECOMMENDATIONS

1. That further research studies be conducted in the area of computer testing.
2. That additional computer inservice training be provided for LPN Instructors.
3. That the competency model developed in this project be replicated in other LPN Programs.